Skin Cancer Among Young Adults: An Overview

An Honors Thesis (HONRS 499)

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Abstract

Skin cancer is a serious disease that is caused primarily by damage to the skin through exposure to the sun's Ultra-Violet rays. Because skin cancer's primary cause is exposure to the sun it should be relatively easy to decrease the rates of this disease with increased education efforts leading to behavioral changes. This paper begins by discussing cancer in general including the various types of cancer, cancer incidence and prevalence rates, and treatments available. Next skin cancer is addressed more specifically including its types, incidence and prevalence rates, treatments available, prevention methods, and risk factors. In addition several studies were summarized discussing the knowledge and attitudes of young adults towards the risk factors that lead to cancer. The acceptance and popularity of a suntan was also examined. A variety of educational programs were then discussed to describe current strategies implemented to combat this disease. The conclusion provides an analysis of some of the educational programs and suggestions for improving the outcomes of skin cancer educational programs.

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Skin Cancer Among Young Adults: An Overview

Introduction

Though skin cancer is an almost completely preventable disease, the rates of its occurrence in the United States have been rising every year since the 1970's. Some types of this cancer are lethal and nearly 8,000 people die from melanoma every year in the United States ("Statistics About Melanoma," n.d.). Therefore, it is very important that the message about the dangers of skin cancer is communicated to people of all ages so that they learn how to prevent getting this disease.

Types of Cancer

Before learning about the specifics of skin cancer it is helpful to understand a general definition of cancer. A healthy cell grows and divides until the time it is programmed to die. Cancer is a disease in which abnormal cells begin to grow and divide without control. They do not die in an orderly way as healthy cells do, but these abnormal cells continue to grow. In addition, they can also spread to other healthy tissues nearby, or spread the disease to more distant parts of the body through the blood or lymphatic system ("What is Cancer?," 2004).

There are many different types of cancer. Some types are named based on where they form in the body. Carcinomas form in the skin or tissues that line the internal organs. Sarcomas form in bone, cartilage, and other connective tissues. Leukemia is a type of cancer that grows in the blood-forming tissues like bone marrow. Lymphoma is a cancer that forms in the cells of the immune system ("Dictionary of Cancer Terms," n.d.).

Some specific places where cancer often forms in the body are the breast, lung, prostate, and colon.

A common cancer for a woman to develop is breast cancer. The most common type of breast cancer is called ductal carcinoma. The breast is divided into many sections called lobes, and the lobes are divided up into smaller parts called lobules and contain many bulbs that can produce milk. The lobes, lobules, and bulbs are connected by ducts, which are small tubes. Ductal carcinoma is cancer in these connecting ducts of the breast, specifically of the skin or lining of the duct. Other kinds of breast cancer are lobular carcinoma, which is cancer of the lining of the lobes or lobules, and inflammatory breast cancer, which causes the breast to be red in color, warm, and swollen in size ("Breast Cancer," n.d.).

Another common cancer is lung cancer. There are two different kinds of lung cancer, non-small cell and small cell lung cancer. Each kind of lung cancer has specific types of cancers whose cells grow and spread in different ways. Non-small cell lung cancer has five specific types: squamous cell carcinoma, adenocarcinoma, large cell carcinoma, adenosquamous carcinoma, and undifferentiated carcinoma ("Non-Small Cell Lung Cancer," n.d.). There are three types of small cell lung cancers: small cell carcinoma, mixed small cell/large cell carcinoma, and combined small cell carcinoma. Risk factors for small cell lung cancer are smoking tobacco, being around the smoke of tobacco products, or being exposed to asbestos or radon ("Small Cell Lung Cancer," n.d.).

Prostate cancer is a carcinoma type cancer that develops in the prostate gland. The prostate is part of the male reproductive system and is a gland that produces a fluid

contained in semen. The gland is found below the bladder, in front of the rectum and surrounding part of the urethra ("Prostate Cancer," n.d.). Prostate cancer is found most often in men over 50 and most often in men over 70 ("SEER*Stat Database: Incidence," 2004).

Colon cancer is another cancer that is fairly prevalent. The colon is a part of the digestive system, specifically the first 6 feet of the large intestine; it is also sometimes called the large bowel. Colon cancer occurs in this organ and under most circumstances, when the cancer has not metastasized, it is highly treatable. When surgery is used as the treatment it is cured in about half the diagnosed cases ("Colon Cancer," n.d.).

Cancer Incidence and Prevalence Rates in the United States

Cancer can develop anywhere in the body and some common sites have already been discussed. Certain cancer sites are more prevalent than others and are different for each sex. In the year 2000 in the United States, the top 15 cancer sites in order of prevalence for men of all ages and races were: prostate, lung and bronchus, colon and rectum, urinary bladder, non-Hodgkin lymphoma, melanomas of the skin, kidney and renal pelvis, oral cavity and pharynx, leukemias, pancreas, stomach, esophagus, larynx, brain and other nervous system (ONS), and the liver. In the year 2000 in the United States, the top 15 cancer sites in order of prevalence for women of all ages and races were: the breast, lung and bronchus, colon and rectum, corpus and uterus, ovary, non-Hodgkin lymphoma, melanomas of the skin, thyroid, urinary bladder, pancreas, cervix uteri, leukemias, kidney and renal pelvis, oral cavity and pharynx, and brain and ONS.

Many of these cancers are the same for both sexes but some are different with the obvious ones being those of the sex organs found only in men or women. Of cancer sites

that were in common for men and women, men had a higher rate for all of them. Males also had a higher rate of stomach, esophagus, larynx, and liver cancers, which were not on the women's list of top sites. The only common cancer that women suffer from at a higher rate than men was thyroid cancer, which was not on the men's list of top 15 sites (CDC, 2000).

Along with gender, certain age groups also have varying rates for cancer. In terms of cancer rates per 100,000 people, the oldest age groups have the highest rate of cancer. Published in 2000, these statistics include all races, and all cancers except for non-melanoma skin cancers. For both men and women beginning with the 85 years and older age group and moving down to the less than one-year-old group the rates get lower with each group. Statistically the longer a person lives the greater the chance they will develop some type of cancer.

Each age group has a different group of cancers that are more prevalent. For the ages birth to 19 years, the most prevalent cancer sites for males and females of any race based on their rate per 100,000 people were leukemia, brain and ONS, and non-Hodgkin lymphoma. The same statistics show that for the age group 20-29 years of age the most prevalent cancer sites are melanoma of the skin, thyroid, non-Hodgkin lymphoma, and brain and ONS. For 30-39 years of age, the most prevalent cancers are breast, melanoma of the skin, thyroid, and non-Hodgkin lymphoma. For 35-44 year olds the most prevalent are breast, melanoma of the skin, lung and bronchus, and non-Hodgkin lymphoma. For those of age, 45-64 the most prevalent are breast, lung and bronchus, colon and rectum, urinary bladder, oral cavity and pharynx, and non-Hodgkin lymphoma. For individuals 65 years and older, the most prevalent cancers are colon and rectum, lung and bronchus,

breast, urinary bladder, non-Hodgkin lymphoma, pancreas, and leukemia ("SEER*Stat Database: Incidence," 2004).

These statistics demonstrate that cancer rates increase with age. At younger ages, brain cancer was prevalent but disappeared from the top of the list for older age groups. Older age groups also suffered from higher rates of cancers like lung and colon cancer, which younger ages had in very low rates. The one cancer that appeared in every age group was non-Hodgkin lymphoma, although at varying rates. Melanoma also had a moderate rate in every age group except for the youngest (birth to 19 years of age) ("SEER*Stat Database: Incidence," 2004).

Cancer Treatments

Several cancers as well as their statistics have discussed. In addition, it is important to know how cancer can be combated through various forms of treatment. Some treatments are chemotherapy, radiation therapy, biological therapy, bone marrow transplants, gene therapy, and cryosurgery.

Chemotherapy is a very common treatment for cancer. Chemotherapy uses anti-cancer drugs to destroy cancer cells. As the drugs travel through the bloodstream they can reach cancer cells located anywhere in the body. The drugs prevent the cancer cells from continuing to grow and divide "What is Chemotherapy?," Oct. 2003). Healthy cells can be killed as well due to this treatment and that is the cause of the side effects seen with chemotherapy. These healthy cells usually grow back after the treatment stops. A combination of drugs might be used in chemotherapy, or chemotherapy might be used in conjunction with other treatments such as surgery, radiation therapy, or biological therapy ("Understanding Chemotherapy," 1999).

Radiation therapy uses ionizing radiation to kill cancer cells and shrink tumors. The radiation destroys or injures nearby cells by damaging their genetic material. This can also harm healthy cells but they usually recover once the therapy has ended. Radiation therapy can be used for every kind of solid tumor as well as leukemia and lymphoma. There are two main kinds of radiation therapy, external and internal radiation therapy. External radiation is produced from a machine outside the body and is given on an outpatient basis. External radiation can be used to treat most cancers including cancer of the bladder, brain, breast, cervix, larynx, lung, prostate, and vagina. Internal radiation is radiation placed near the tumor or inside the tumor with the radiation source enclosed in a holder called an implant. This kind of radiation often requires a hospital stay and is used to treat cancers of the head and neck, prostate, cervix, ovary, breast, peri-anal and pelvic regions. Another form of internal radiation is called systemic radiation and involves radiation being administered through oral doses or injections. This allows the radiation to travel throughout the body and can be used to treat thyroid and adult non-Hodgkin's lymphoma ("Radiation Therapy," 2004).

Bone marrow transplants are another treatment for cancer. The bone marrow is the soft area inside bones that contains hematopoietic (blood forming) stem cells. These cells are fast dividing and therefore are often killed during chemotherapy along with cancer cells. Other hematopoietic stem cells are found in the bloodstream and they are called peripheral blood stem cells. Hematopoietic stem cells can also be harvested from an umbilical cord. Hematopoietic stem cells can form three types of cells: white blood cells, red blood cells, or platelets ("Bone Marrow Transplantation," 2004).

There are three kinds of bone marrow transplants. A transplant of bone marrow from the patient back to the patient is called an autologous transplant. This kind of transplant involves removing some bone marrow from the patient, storing it and then transplanting it back into the patient after they have undergone their treatment. A transplant to a patient from their identical twin is called a syngeneic transplant. A transplant from anyone else besides the patient or a twin is an allogeneic transplant ("Bone Marrow Transplantation," 2004).

There are two reasons that bone marrow transplants are used. The first is that they replenish the hematopoietic stem cells that are destroyed by very high doses of chemotherapy or radiation therapy. The other reason is only pertinent for allogeneic transplants. With some types of leukemia when a bone marrow transplant is given there is a graft-versus-tumor effect. This means that the white blood cells from the donor, which are called the graft, find any remaining cancer cells in the patient and attack them as being foreign. Bone marrow transplants are usually used to treat leukemia and lymphoma and are most effective when all signs of cancer have disappeared and the cancer is said to be in remission. Bone marrow transplants are also used for neuroblastoma, a cancer in immature nerve cells that affects infants and young children, as well as for multiple myeloma ("Bone Marrow Transplantation," 2004).

Biological therapy is a treatment that helps the immune system fight cancer differently from most other treatments because it does not attack cancer cells directly. The main way biological therapies work is to re-create immune system substances in the lab. These lab created substances are called biological response modifiers (BRMs) ("Biological Therapy," 2004).

There are several types of BRMs that can be used to treat cancer. Some of these treatments have been approved by the FDA for use, while many others are being researched for cancer treatment. Interferons are one type; they were the first BRMs to be produced for this purpose. Interferons help to improve the way a cancer patient's immune system responds to cancer cells and they can act directly on cancer cells to slow their growth and help them to develop into cells with more normal behavior. Interferon alpha is currently in use for treatment of leukemias and melanoma. Interleukins are similar to interferons. The interleukin IL-2 is a BRM that stimulates growth of immune cells that destroy cancer cells. This is used specifically in treatment of metastic kidney cancer and melanoma. Monoclonal antibodies (MOABs) are another kind of BRM. These are antibodies that are produced by a specific kind of cell and are specific for a certain antigen. Scientists have discovered how to create the MOABs in large amounts and they can be used to treat cancer by increasing the immune response, or interfering with the growth of cancer cells. Another way they work is by being linked to another form of anticancer drug, then when the antibody latches onto the cancer cell the drug is released directly into the cell destroying it. Some examples of current uses are the MOAB Rituxan, which treats non-Hodgkin's lymphoma, and the MOAB Herceptin, which is used to treat metastatic breast cancer ("Biological Therapy," 2004).

Cryosurgery is a treatment that can be used for cancer on the skin or in an internal tumor. As a treatment for external cancerous tumors, the extreme cold produced by liquid nitrogen sprayed directly on the skin or applied with a cotton swab destroys the cancerous cells. When the frozen tissue thaws, it dissolves and a scab forms. For internal tumors, the liquid nitrogen is circulated through a hollow cryoprobe causing a

ball of ice crystals to form around the probe. The probe is brought into contact with the tumor by guidance from either an MRI or ultrasound. When the probe comes in contact with the tumor it freezes the cells and they later thaw and are absorbed by the body. Cryosurgery can be used for treating prostate and liver tumors, retinoblastoma (a tumor affecting the retina of the eye), and early-stage carcinoma skin cancers. Cryosurgery is also being researched for possible use in the treatment of breast, kidney, and colon cancers ("Cryosurgery," 2004).

Gene therapy is an experimental cancer treatment that can only be received as part of a clinical trial. Gene therapy involves the insertion of genetic material, either DNA or RNA, into the patient's cells to help fight disease. Many different uses of gene therapy are being studied in trials to see how it could be used to fight cancer. One way is to substitute a working gene for a missing or mutated gene that might be the cause of cancer. Another way is to use gene therapy to try to improve the body's natural immune response to fight cancer. Scientists are also injecting cancer cells with genes that are supposed to make them more susceptible to existing treatments like chemotherapy or radiation therapy. Another study involves placing a gene into healthy hematopoietic stem cells, which is supposed to make them more resistant to high doses of anticancer drugs ("Gene Therapy," 2003).

Before gene therapy can become a common treatment for cancer some obstacles in the technology need to be overcome. First, scientists need to find a way to deliver the genes to the body effectively. To do this they need vectors that will deliver the gene into the genetic material of the specifically targeted cells consistently. Also the transplanted genes must be able to be controlled by the body ("Gene Therapy," 2003).

There are other treatments that are advertised as helping the body fight off cancer which are not promoted by allopathic medicine. These are called alternative treatments and often they have not undergone clinical trials to prove their efficiency or safety. One of these alternative treatments involves antineoplastons, which are a group of compounds that were isolated from human blood and urine, and can be synthetically manufactured ("Antineoplastons," 2001). Antineoplastons are believed to be a part of the body's natural defense system against cancer. The treatment is given either orally or through injections. Research about these compounds has been ongoing since 1967 and some clinical trials were started in the United States to learn more about their effects fighting a variety of cancers. The original doctor who discovered these compounds, Dr. Burzynski, claims that they can reprogram cancer cells to restore errors in cells back to normal. He also says that antineoplastons halt the cell cycle in tumor cells preventing their further growth. Advanced phases of trials from outside groups found very little evidence that antineoplastons had an effect on most cancers. Brain tumors responded to this treatment at a rate of 7.7 percent and were the only cancer to show a positive effect to the therapy ("Unconventional Therapy," n.d.).

Bovine and shark cartilage are both being studied for their effectiveness in treating cancer. This study began more than thirty years ago because of a hypothesis that cartilage has at least one substance that inhibits blood vessel formation. If a tumor is prevented from developing blood vessels it cannot grow larger than a few millimeters. The development of these blood vessels by the cancerous tumor is called angiogenesis, and cartilage is being studied for its angiogenesis inhibitors. Three angiogenesis inhibitors have been found in bovine cartilage and two in shark cartilage. From the trials

done on humans the results have been inconclusive, but further trials are currently being performed ("Cartilage," 2004).

Gerson therapy is an alternative approach to treating cancer that focuses on diet. It was developed by Dr. Max B. Gerson and gained attention in the 1930's. The diet calls for drinking thirteen glasses a day of fresh organic fruit and vegetable juices and eating vegetarian meals prepared from organic fruits, vegetables, and whole grains. Various supplements are also taken including potassium, thyroid hormone, and injectable crude liver oil. Salt, spices, aluminum cookware and utensils are not used when preparing food. Enemas are also recommended on a regular basis to detoxify the body. In 1946 Dr. Gerson testified that 30% of his patients with cancer improved with this treatment. A later study by the National Cancer Institute found that because the patients were also receiving other anti-cancer treatments their response could not be pinpointed as being from the Gerson therapy. No further official studies have been done on Gerson therapy ("Gerson Therapy," 1999).

Milk thistle is an herbal plant that is proposed to have anticancer qualities. One substance it contains is silymarin which has been found to function as an antioxidant, to stimulate regeneration of liver tissue, inhibit the growth of certain cancer cell lines, exert a direct cytotoxic activity toward certain cancer cell lines, and possibly increase the efficacy of certain chemotherapy drugs. Studies have been run on milk thistle regarding its effect on cirrhosis and hepatitis but no studies on its effect on cancer have been published ("Milk Thistle," 2004).

Newcastle disease virus (NDV) has been studied as an alternative treatment for cancer. NDV is a potentially fatal, non-cancerous disease in birds and is only a minor

illness in humans. NDV replicates more easily in human cancer cells than in normal human cells. NDV is classified as being a part of one of two strains, either lytic or non-lytic. Both have the potential to kill cancer cells but the lytic strand does it more quickly because it affects the plasma membrane of the infected cell. The non-lytic strains kill by interfering with cell metabolism. Lytic strains have been studied for their ability to kill cancer cells directly and both strains have been used to make vaccines that hope to stimulate the immune system to fight cancer. The clinical trials that have been run had successful results with benefits being found in more than twelve studies. However, the results were seen as being inconclusive because the design of the studies was weak and the reports were somewhat incomplete. This form of treatment seems to have a lot of potential and with further study and more complete tests it might prove to be very useful in treating cancer ("Newcastle Disease Virus," 2004).

Skin Cancer

Types of Skin Cancer

Skin cancer is one of the most preventable cancers. Up to ninety percent of skin cancers could be prevented by using protection to avoid the sun's radiation. It is often caused by exposure to Ultra-Violet light exposure. There are three types of skin cancer: basal cell carcinomas, squamous cell carcinomas, and malignant melanomas.

Malignant melanoma is the most serious because it grows very quickly, but most cases of skin cancer are treatable and even curable (Munson, n.d.). Melanoma is the least common of the skin cancers. Melanoma affects the cells that produce melanin, a pigment for skin and hair color. Melanoma can also affect the portion of the eye that has pigment. There are also several types of melanomas. One is superficial spreading melanoma,

which is the most common form and can occur at any age or site on the skin. Another is nodular melanoma, which begins as a raised area and is usually dark blue in color. Lentigo meligna melanoma usually forms in the elderly at sites that have been sun-damaged. Acral letiginous melanoma is the least common type and forms on the palms, soles, or under the nails ("Melanoma," 2003).

Basal cell carcinoma is a skin tumor that is slow growing and causes cancerous changes in basal skin cells. An example of a cancerous change would be a pain-free bump on the skin. Basal cell carcinoma then develops from this cancerous change into cancer. This is the most common type of cancer in the United States ("Basal Cell Carcinoma," 2004).

Squamous cell carcinoma is a malignant tumor that affects the middle layer of the skin. It is more aggressive than basal cell carcinoma, because even though it is also slow growing it is more likely to metastasize. Squamous cell carcinoma also develops from cancerous changes in the skin but these take place in the middle layer of the skin. It may form from normal skin, from skin with a chronic inflammation, or from skin that has been overexposed to the sun ("Squamous Cell Cancer," 2004).

Incidence and Prevalence of Skin Cancer

Melanoma is the leading cause of cancer death in women between the ages of 25 and 30 and one in 85 people will develop melanoma at some point in their lifetime ("Melanoma," 2003). It is believed that about 55,100 people have been diagnosed with melanoma in 2004. The rate of diagnosis has increased by about three % every year since 1981, which is a decrease from the period of 1973 to 1980 when the rise was about six % a year ("Statistics About Melanoma," n.d.). Malignant melanoma causes 75% of

the deaths from skin cancer every year ("Facts and Statistics," n.d.). The mortality rate for melanoma has increased 50% from the early 1970's. In 2004 7,910 people are expected to have died from melanoma in the U.S. this year ("Statistics About Melanoma," n.d.). Between 1996 and 2001 the U.S. mortality rate each year due to melanoma was between 2.6 and 2.7 per 100,000 ("SEER*Stat Database: Incidence," 2004).

Because the two non-melanoma cancers are often cured, their statistics are not reported as often as the cancers with higher mortality rates. This means that the statistics available for squamous and basal cell carcinoma are limited and are often just estimates. It is believed that over 1,000,000 people are diagnosed with non-melanoma skin cancer each year. Men are diagnosed with these skin cancers at almost twice the rate of women. The rate of this cancer is believed to increase by five percent every year. The deaths from these cancers are also not reported but about 1,000 to 2,000 people are believed to die from these cancers every year. Usually because they were not diagnosed and treated early, or because of decreased immune function because of other illness or age. These deaths occur most often in the elderly ("Statistics for Nonmelanoma Skin Cancer," n.d.).

Cancer statistics divided by age group show that the rate of melanoma increases with age. From ages birth to 19 there is a rate of .4, for 20-29 the rate is 5.3, for 30-39 the rate is 11.8, for 35-44 the rate is 15, for 45-64 the rate is 23.3, and for 65 and over the rate is 37. The preceding rates were cases diagnosed per 100,000 people, and were compiled for all races of both sexes ("SEER*Stat Database: Incidence," 2004). Melanoma is also the most common cancer among people of ages 25 to 29 ("Facts and Statistics," n.d.).

Screening for Skin Cancer

Looking for skin cancer before symptoms develop is called screening. It can catch skin cancer early or help prevent it entirely. Screening is important because when detected early it decreases the chance of mortality from the cancer (Ferrini, 1998). Common screening practices for skin cancer are regular skin examinations by a physician or by patients themselves. Most of the time melanoma can be detected by the naked eye. When an abnormal area of skin is found, a biopsy might be done to remove some of the skin and have it checked to see if any of the cells are cancerous ("Screening," 2004). The examination that a doctor would perform as a screening for skin cancer is called a total cutaneous examination and it involves a short, two-three minute visual inspection of the skin. The scalp is included in this examination because it is the site of a large amount of sun exposure. Also included in the examination might be questions about sun exposure and family history to help identify the patient's risk. The total cutaneous examination is a fairly effective method of screening for skin cancer when a qualified physician performs it. One drawback is that there can be disagreement between examiners as to the diagnosis of an abnormal area of skin and also that there is a tendency to over diagnose during a screening of this kind (Ferrini, 1998).

During self-screening one important thing to look for are changes in the skin's appearance. Moles are commonly checked to see if they have become cancerous. There are several signs to look for to begin to determine if a mole might be cancerous. Is the mole new or growing, does the mole have a ragged edge, does it contains different colors, does the mole have a red edge, is the mole bleeding or oozing, or is the mole itchy? Those are all questions that can be asked when doing a self-screening. Along with

examining moles it is also important to look at all of the skin, including the scalp when doing a self-exam. Skin cancer can form at any location on the skin even on the soles of the feet. It forms most often on areas that receive the most exposure to the sun, so the head, arms and legs should be examined closely. No part of the skin should be left out in a thorough examination. When a self-screening turns up something abnormal, a doctor then needs to make an evaluation and do further screening ("Check your Moles," n.d.).

Skin Cancer Treatment

Once a diagnosis of skin cancer is made, a treatment regimen is then prescribed. There are four standard ways in which basal and squamous cell carcinomas are usually treated. One of these is surgery of which there are many kinds.

Mohs micrographic surgery is often used to remove cancerous tumors from the face. A great benefit of this method is that it removes as few non-cancerous cells as possible. The treatment involves cutting the tumor from the skin in thin layers. As each layer is cut, the edges of the tumor and the top layer of skin are examined with a microscope to look for cancer cells. Layers continue to be cut away until no cancer cells are detected ("Skin Cancer Treatment," n.d.).

Another type of surgery that is not as complicated as Mohs micrographic surgery is simple excision. This involves cutting the tumor from the skin as well as some of the normal skin around it. A shave excision is a variation of this; it involves shaving the tumor off the skin with a small blade. In a treatment called electrodessication, a tool called a curette is used to cut away the tumor. Then a needle-shaped electrode is used to apply an electric current to the area, which stops the bleeding and also kills any cancerous

cells that might remain. This method might be repeated up to three times during the tumor removal ("Skin Cancer Treatment," n.d.).

Cryosurgery, or cryotherapy, is used as a treatment to remove cancerous cells by freezing and destroying them. Laser surgery, which uses a laser beam as a knife could be used. The cuts it makes are bloodless and it is used to remove surface tumors. Dermabrasion is a treatment that uses a rotating wheel or small particles to rub away the top layer of skin cells, including both normal and cancerous cells ("Skin Cancer Treatment," n.d.).

Radiation and chemotherapy are other types of standard treatments for these non-melanoma skin cancers. They are used in the same ways as described previously for treatment of any type of cancer. Radiation therapy uses high doses of radiation either externally or internally to treat cancerous cells. The method of radiation depends on the stage and size of the skin cancer. Chemotherapy uses drugs to treat and kill cancer cells. For these types of skin cancer it is sometimes applied topically ("Skin Cancer Treatment," n.d.).

A fourth type of treatment for these cancers is photodynamic therapy. This treatment uses a combination of a drug and a specific kind of laser light to kill cancer cells. The drug is injected into a vein and collects more in cancerous cells than normal cells. The drug then remains inactive until exposed to the light, which is applied via fiber optic tubes. This type of treatment is very effective for tumors that are on or just below the skin, and damages very little healthy tissue ("Skin Cancer Treatment," n.d.).

Treatment for melanoma is not the same as it is for squamous and basal cell carcinoma. Some of the same treatments are used but different methods are applied due

to the differences in the diseases. Melanoma has many stages, depending on its size and whether or not it has spread through the body. The progressing stages are treated differently and as the stages progress the melanoma has to be treated with more thorough methods, which remove more of the skin and test for metastasis throughout the body.

Radiation and chemotherapy are also used to treat melanoma. However, the drugs are not applied topically in chemotherapy, instead they are used in a method called hyperthermic isolated limb perfusion. This sends the drugs directly to the arm or leg where the cancer is located. This is accomplished by stopping the blood flow to the pertinent limb with a tourniquet. Then a warm solution containing the drugs is sent directly into the blood of the limb. This makes it possible to give a very high dose of the anti-cancer drug without affecting the entire body ("Melanoma Treatment," n.d.).

Surgery is also used but different methods are employed. Local excision is used to remove the melanoma as well as some of the normal cells surrounding it. A slightly changed version of this is called wide local excision, with the difference being that more of the skin surrounding the melanoma is removed and often nearby lymph nodes as well. Another kind of surgery is lymphadenectomy, which is used to remove lymph nodes and examine them for cancer. This is necessary because melanoma often metastasizes to other areas of the body through the lymph. A sentinel lymph node biopsy is another method of surgery. This involves the removal of the first lymph node that the melanoma would probably spread to and examining it for cancer. This particular lymph node is found by injecting a dye near the tumor. The dye spreads and the first lymph node it reaches is then removed and examined by a pathologist. If no cancer is found then it might not be necessary to remove any other lymph nodes ("Melanoma Treatment," n.d.).

A different treatment used for melanoma, which is only in clinical trials for non-melanoma skin cancers, is biological therapy. This treatment was discussed previously for general cancer treatment. Substances made by the body or in the laboratory are used to boost the immune system and encourage it to use its natural defenses to fight the cancer ('Melanoma Treatment," n.d.).

Skin Cancer Prevention

The best way to avoid skin cancer is to take preventative steps. The preventative steps involve protecting the skin from damage that can lead to cancer, such as sunburns. Some steps include: wearing sunscreen, avoiding the sun, wearing shielding clothing including a hat, wearing Ultra-Violet (UV) radiation reducing sunglasses, and using a lip balm with an SPF in it. A very common method for preventing sunburn is to wear sunscreen. Use of sunscreens can reduce the chance of developing basal and squamous cell carcinomas. The effect sunscreen has on preventing melanoma is not as well known. Sunscreens have a sun protection factor known as SPF, which refers to their ability to block UVB rays. There are three types of Ultra-Violet rays.

The first are UVC, which are potentially the most harmful in terms of damage to skin, but they are completely blocked out by the ozone layer.

UVB rays have the biggest risk of immediate danger. They penetrate the epidermis causing the cells that produce melanin to be activated causing a tan and possibly sunburn. These rays are blocked partially by clouds and much more by physical barriers such as windows or clothing ("Ultra Violet Rays," n.d.). When used appropriately, sunscreen can adequately block UVB rays from damaging the skin (Landow, 2004).

UVA rays are more numerous than UVB rays and also cause more lasting damage. UVA rays cause wrinkles, age spots, and a loss of elasticity in skin. When joined with UVB rays damage includes destroying vitamins in the skin, dilating blood vessels to create sunburn, and killing skin cells. UVA rays are not blocked by the ozone layer, windows, or common sunscreens ("Ultra Violet Rays," n.d.). UVA rays are believed to have a major role in causing genetic changes, which can lead to melanoma (Landow, 2004).

It is important to wear sunscreen with an SPF of at least 15, even on cloudy days to get protection from the sun's rays. It should be applied 30 minutes before going out into the sun and should cover all areas of the skin that will be exposed to the sun. The sunscreen also needs to be reapplied every few hours if exposure is prolonged ("Safe-Sun Guidelines," 2002).

An easy way to prevent skin cancer is to avoid the sun, and therefore avoid the damage it can cause to skin. The sun is the strongest between about 10 a.m. and 4 p.m. and during this time it is easier to become sunburned or suntanned, both of which are signs of sun damage. By avoiding unprotected sun exposure during these hours, damage can be prevented.

Tanning beds are sometimes used to get a tan without going out into the natural sun. The lights used in these beds provide the some of the same radiation as the sun and can damage the skin as well. These should be avoided just as natural sunlight should be to prevent skin cancer ("Safe-Sun Guidelines," 2002). Wearing clothing that covers the body and a hat with a brim that provides shade for the face and neck is another way to avoid the radiation of the sun (Landow, 2004).

Risk Factors for Skin Cancer

Individual Risk Factors

There are many risk factors for both melanoma and non-melanoma skin cancers, any behavior that causes damage to the skin is a risk factor for skin cancer. Some are hereditary, and others involve the behaviors people participate in relating to the sun. Many of the risk factors are the same for both types of cancers, these are: having fair eyes and hair, burning easily after sun exposure or having difficulty tanning, having freckled skin, having a family history of skin cancer, having a personal history of skin cancer, having been exposed to a large amount of radiation, suffering from immunosuppression, and having had radiation therapy. Some risk factors that only relate to melanoma are having more than 50 moles, having a history of severe sunburns, having atypical moles, or a changed mole ("Physician Practices," 1996).

The risk factor of having fair hair and eyes is simply a way to determine what kind of skin type a person has. People with fair hair and eyes probably also have fair skin which will burn easily and be at a greater risk than those with dark hair and eyes who probably do not burn easily. People who burn easily are at a greater risk because with every burn they receive their risk for developing skin cancer goes up. Having freckled skin also relates to having fair skin and burning easily after sun exposure ("Risks and Causes," 2004).

Having a family history of skin cancer can mean that a person has the same skin type as their relatives and their risk is increased. It could also mean that a faulty gene has been inherited, which increases the risk of getting melanoma. There are a few of these faulty genes that have been discovered, and more research is being done to identify

others. About one in 10 cases of melanoma are thought to be caused by an inherited faulty gene. If a person has a history of skin cancer then their risk is greater because cancer always has a risk of recurring. If they initially developed skin cancer because of skin damage they had obtained in the past, that risk will always be there. Another reason is that because they have had skin cancer their skin was particularly susceptible to damage and any further damage they get will increase their risk even more ("Risks and Causes," 2004).

Any exposure to radiation whether job related, accidental, or due to radiation therapy all are risk factors because the radiation might cause skin damage. Having a large amount of moles or atypical moles is a risk factor because a mole can become cancerous if it is exposed to radiation and becomes damaged ("Risks and Causes," 2004).

If a person has a history of severe sunburns then they have suffered from skin damage. Anytime a person gets a suntan or sunburn it is proof that some damage has occurred to their skin. The more sunburns a person receives the greater the amount of damage and the higher the risk of getting skin cancer ("Risks and Causes," 2004). As few as five sunburns as a child can double the risk of getting skin cancer ("Risk Factors," 2000).

Where a person was born can also be a risk factor. Being born in a hot sunny country is a risk factor because their skin might have been exposed to high amounts of radiation when it was very delicate ("Risks and Causes," 2004).

Behaviors & Attitudes Regarding Skin Cancer

People who possess genetic or hereditary risk factors should be extra cautious to protect their skin from the sun. Other risk factors involve specific behaviors, such as

prolonged exposure to the sun due to not wearing sunscreen, sun bathing, or using a tanning bed. If these behaviors are modified, a person's risk for cancer would cease to increase. Tanning in the outdoors or in a tanning bed exposes the skin to UV radiation. The sun has both UVA and UVB radiation but a tanning bed has only UVA rays. There is still some doubt as to how many cases of skin cancer can be directly related to tanning bed use because some of the research that has been done is contradictory. Laboratory research has demonstrated that the type of ultraviolet light used in tanning beds (UVA) can cause all types of skin cancer. Studies are also starting to appear that show tanning bed use is a definite risk factor for malignant melanoma. For example, people who occasionally use tanning beds have more than three times the risk of developing melanoma of the eye compared with those who never use a tanning bed ("Risks and Causes," 2004).

Even when people have been educated about the dangers of skin cancer and how it can be prevented, they do not always take part in preventative behaviors. This can be attributed in part by optimistic bias, or feeling like "that won't happen to me". Optimistic bias means having a reduced amount of worry about contracting a disease personally, even while realizing that a person in the general public would have a much higher risk while participating in the same behaviors. This contributes to people being educated about the risks of a disease but not participating in prevention behaviors (Clarke, 1997).

The following are discussion summarizes research studies on the behaviors and attitudes of young adults regarding their exposure to the sun. Most of the genetic mutations that result in skin cancer occur during childhood and adolescence. People of

this age are also prone to risk taking behaviors that increase the likelihood of developing skin cancer.

A study published in 1996 was done on Australian young adults between the ages of 16 and 25. It revolved around the beliefs and practices of young adults and their time spent tanning and using sun protection. The study showed that 26% of the participants avoided a tan, 41% tanned a little, 24% tanned until they achieved the color they wanted, and 9% got as dark as possible. They knew about the risks they were taking though, because 55% protected their skin most of the time with sunscreens. However, they did not understand the real meaning of protection because they were still exposing their skin to the sun with the object of getting a tan, which is basically sun damage. The study found that skin type is related to behavior. Those with a skin type that only tans will seek out a tan more than someone who only burns. They received a positive reinforcement of getting darker skin, while someone who only burns would only receive negative reinforcement from sun tanning behaviors. The study creators felt that education efforts needed to be most focused on those who burn and then tan as they are very likely to continue to suntan, and still have a high risk of obtaining cancer from this behavior. Those whose skin only tans are still taking a risk but because of their skin type it is lessened versus those who do burn from sun exposure (Clarke, 1997).

Another study was done at an unidentified university in the midwest of the United States on students enrolled in a health class. Nearly ninety percent of the participants were between 18 and 21 years of age. Seventy-one percent of the study participants said they had previously used an indoor tanning device before they were 18 years old. Approximately eighty percent of respondents said they tanned indoors, as well as

sunbathed outside. Of the students who did use indoor tanning devices, 54% went one or more times a week. Of the indoor tanners, two-thirds had received a burn once or twice, 28% had been burned three to five times, and six percent had been burned more than five times (Young and Walker, 1998).

Another study focusing on American college students, most of whom were between 20 and 21 years of age, looked at knowledge about skin cancer, benefits of a sun tan, and sun-protection behaviors. Of the subjects in the study, 25% said they never suntanned, 37.5% said they tanned one or two times a month, and 15.2 % said they tanned three or more times a week. Of the students that tanned, 26.3% said they tanned for 20 minutes or less, and 21.4% said they tanned longer than 60 minutes. More than seventy-five percent of the students said they had suntanned to the point of a burn that blistered, and 11.6% said they had blistered more than five times. Both the common practice of sun tanning, and receiving an intense period of exposure such as these kinds of burns would indicate, are risk factors for skin cancer. Non-melanoma types are related to the cumulative effect of sun exposure and melanomas are related to intense episodes of exposure. Of these students, 20.5% preferred a light tan, 36.2% preferred a medium tan, and 17% preferred a dark tan. Most of the students also put a high value on a suntan with 82.1% of students indicating this (Lamanna, 2004).

Popularity of a Tan

As previously discussed, research studies show that many young adults are taking part in behaviors that can increase their risk for skin cancer. This can be partly explained because of the high value that is put on a suntan in today's society. In the study of the midwestern university discussed previously, college students said they tanned indoors for

many reasons. They said they were influenced by friends, advertisements in newspapers, magazines, television, a significant other, the ability to get a tan at any time of day, the ability to have a tan year round, and the opportunity to relax while tanning. The students appeared to believe that a tan was healthy because 62% agreed with the statement that a tan looked healthy. Eighty-six percent believed they looked better with a tan, 65% believed tanned skin was more attractive than having no tan, 56% felt that having a tan made them feel sexy, and 35% believed a tan made them look thinner. All of these things point out that having a tan was a major value to the students. In most cases this value was enough to outweigh the possibly negative effects from the sun exposure they received to obtain the tan (Young & Walker, 1998).

A suntan has not always been seen as popular in American culture. About a hundred years ago a tan was a sign of someone who had to work in the outdoors to earn their living, and the wealthy were proud of their pale skin. With the Industrial Revolution laborers began to work most commonly in factories, and almost everyone spent their time indoors. This meant that now only the wealthy had the luxury of time to sunbathe (Deakin, 1993). Since that time a tan has only grown more popular, even with the increased education about its possible dangers.

The popularity of a tan, as well as the evidence of young adults high rate of sun tanning behaviors seen in the previous studies, indicate that it is important for young adults to be educated about skin cancer and how they can prevent it. This education might make a difference in their behavior to help to lower their own risk for skin cancer, as well as the risk of the children they might have.

Educational Programs About Skin Cancer

Some educational programs are helpful in teaching their audience about the dangers of skin cancer and how it can be prevented, other promotions are not as successful. We will now look at several programs and how they approach educating their different audiences.

Recent Promotions

The National Recreation and Park Association (NRPA) and the Rollins School of Public Health at Emory University have set up a research-based educational program they call POOL COOL. The program incorporates sun safety lessons into existing swim lessons. The program tries to increase awareness about sun protection practices to children between ages five and 10 who take swim lessons, their parents, and the aquatics staff. The program includes five lessons about sun safety and each lesson is about five minutes long. Different lesson topics include avoiding the sun by covering up, finding shade, using sunscreen, and not staying outside very much during the sun's peak hours. When the program was evaluated, it was found that the pools that had implemented POOL COOL had more protected environments, and the parents and children involved had improved their sun protection behaviors by the end of their lessons ("Pool Cool," 2004).

A Morbidity and Mortality Weekly Report published by the CDC in 2002 put together a set of guidelines that schools can use when setting up an educational program for their students on sun safety. Since children spend a significant amount of time at schools, part of that outdoors, schools are an important place for children to learn about ways to prevent skin cancer. The proposed seven guidelines include: setting up a policy

that commits to reducing UV radiation exposure, creating an environment that maintains sun safety, providing age-appropriate education that teaches the children knowledge, attitudes, and behaviors that help them to prevent skin cancer, getting the family involved in the skin cancer prevention program, including in the program the necessary knowledge and skills for all faculty working with the children in the program, balancing the program with other school health services, and evaluating the implementation of the program on a regular basis (Glanz, 2002).

Researchers from Rhode Island have created a skin cancer prevention program designed to be implemented on the beach. They handed out educational materials with suggestions about reducing exposure to the sun, a sun-sensitivity assessment, information about sunscreens, and photographs showing sun damage not visible under regular light. About 3,000 beach-goers were invited to participate in a follow-up program. About 2,300 subjects participated and were sent a follow-up intervention at both two and 12 months. The results indicated that men, especially those over 40, responded very well to this education program and increased their sun protection behaviors. The use of sunscreen increased for all age groups, and both sexes. The age group including teenagers were the least impacted; they were found to use the least protection after the program, but still had an increase in use of sunscreen overall (Newman, 1997).

The University of Texas' M. D. Anderson Cancer Center in collaboration with The University of Texas-Houston Health Science Center School of Public Health have designed an educational program specifically for preschool age children called "Sun Protection is Fun!" Seven Houston area preschools have been involved in the program with the hopes that what is learned at these pilot schools can be used to improve the

program before it is started at other preschools. The program's curriculum consists of seven units, each with five activities, which represent the developmental skills of art, science, dramatic play, music, language arts, and math. The lessons and activities revolve around practicing healthy sun protection behaviors and emphasize the use of sunscreen, wearing protective clothing, use of shade, and limiting exposure to the sun. Before beginning the program in a school the teachers who will be instructing the preschoolers go through two and a half hours of training to learn about the curriculum. The program also includes two videos, one designed for the teachers and the other for the children's families. Both videos feature people who are in all stages of sun protection behaviors, so everyone can identify with someone they see in the video. In addition, the program includes a set of four newsletters for families, and another for teachers, that tell stories about the success of people who are in the program to positively motivate others in the program. Also included in the newsletters are a physician's column and facts about how to prevent skin cancer. To help get the parents involved, there is a parent handbook which gives information about sun protection behaviors and includes pictures about how to role model the behaviors for their children (Tripp, 2000).

The Georgia Harvesting Healthy Habits program set up a sun protection education program designed for kids ages 10-13 to be presented at extension events like 4-H meetings and camps. Their program is meant to run about one to two hours but is presented as being very adaptable. It begins by teaching the youth the basics about skin, cancer, and then skin cancer specifically. It then goes into detail about the different kinds of skin cancer, the causes of skin cancer, and the ways to prevent skin cancer. After the initial learning phase of the program there are three activity stations for the kids to go

through. The first of these is a station where the children can try some different sunscreens and then write down what they like or dislike about each. The next station is a hat station where they try on different hats and rate them on their style as well as how well each would protect them from the sun. The final station is to teach them about skin self-exams. They use a mirror to find any moles or other skin markings they have and then draw them on a picture of their body. The point of the stations is to get the kids to practice these behaviors and also to see their peers doing them as well, with the hope that this will influence them to keep doing the behaviors (Parrott, 1999).

Patient Education

Along with social and school-based programs another way of educating the public about skin cancer and how to prevent it is through patient education. Physicians diagnose illnesses in their patients, but they also educate their patients on how to prevent future illnesses. One of the subjects they might give advice about is skin cancer. It might mean more to hear from a doctor that certain behaviors are dangerous and could lead to cancer than reading it in a pamphlet. There are many reasons why patient education might not be effective. Possible reasons might be if the discussion was not very long or in depth, if the patient did not have a good relationship with the doctor and did not feel comfortable, or if the information was presented in a way that was not convincing. In these cases the patient might leave with the same attitudes about skin cancer that they had before being counseled.

After doing a study on the effectiveness of patient education to prevent skin cancer, the U.S. Preventive Services Task Force found that there was insufficient evidence to recommend this method as effective. They found that counseling parents

increased the chance they would protect their children with sunscreen but that no other protection behaviors were influenced significantly. In the instances where a sun protection behavior was adopted after counseling from a physician the behavior was usually to wear sunscreen but not to decrease the amount of sun exposure. Sunscreen use alone can lead to a false sense of security, this was shown in a randomized trial with young adults, which found that those who used sunscreen with a high SPF stayed out in the sun for a longer time than those who used sunscreen with a lower SPF. While this particular study did not find sufficient evidence to recommend that all primary care physicians should counsel their patients on sun protection and sunscreen use, many organizations do give this recommendation including: The American Cancer Society, the American Academy of Dermatology, the American Academy of Pediatrics, and a National Institute of Health consensus panel (Berg, 2003).

Synthesis and Analysis of Current Skin Cancer Educational Programs

Many educational programs exist that attempt to teach about the dangers of skin cancer and the behaviors that increase risk for the disease. There are many good qualities in these programs. The first that is a part of every program is that they are all doing something to try to spread the word about how to combat this disease that is easily prevented in most cases. Along with this, a number of the programs present their material in a way that is unique and is effective in getting the message across while not seeming like an overt lesson is being preached. This is accomplished in some cases by incorporating the education into programs that already exist such as swimming lessons.

Another important quality of effective programs is that they blend teaching about skin cancer and healthy attitudes, and behaviors that prevent it. It is also important to

teach this very early so that children aren't influenced by the media or advertising and begin to learn the myth of a 'healthy tan'. Along with teaching children early, such as the preschool program that was previously described, good promotions get the whole family involved. This reaches out to more people, and also provides a support system for changing risky behaviors.

Another important quality of some effective programs was showing specific examples of healthy behaviors. This was done through videos and pictures in the preschool program, and they attempted to provide someone for all audience members to identify with, which was important. The extension program for teenagers also attempted this in part when they had the children try on the hats, sunscreen, and do skin self-examinations. While taking part in these activities they could also witness their peers doing the same behaviors, which is an important part of adolescent behavior. If a child sees someone they consider 'cool' doing something this will influence them to think that the behavior might also cool. By seeing other children wearing hats and sunscreen they might now be more likely to do those things themselves in the future.

In the programs summarized , some issues might limit their effectiveness. One quality that is both a positive and negative is that most education programs are age specific. This is good because it allows the programs to be more effective and they can choose an effective means of teaching for that specific age group. The negative about this is that while a program might be set up very well for a certain age group, the people who made the program usually do not also set up programs for other age groups. This means that while there are numerous different programs, there might be gaps in the ages of people who receive this kind of education. At the same time some programs are set

up to possibly be put out nationally, but in a lot of situations they are only implemented locally. This means that there might be gaps in the regions that are educated as well as age groups. Another problem with some programs is that they are set up for only a short time, such as the swim lessons program which only lasted a few weeks. This helps to educate, but does not accomplish what a long-term program would, lasting at least several months. Programs for teenagers have been shown not to be very effective. Some research says that many hours are needed to change their attitudes about risky behaviors that they engage in. A longer-term program might help begin that change.

Based on the literature reviewed, several recommendations for an effective comprehensive sun safety education program are listed below. Ideally, the program would have to be started early in childhood. The program would also be continued throughout a lifetime. By continuing the education through a lifetime the program could start a child out with a sun-safe behavior model and that behavior would be reinforced continually.

It is also important to incorporate the education program into existing school and social programs. This would help to show how prevention could be put into practice in everyday life. The mentors of the program would all have to practice the healthy behaviors that they taught. The settings of the education program would all need to have a sun-safe environment.

An ideal program would be research based and tailored for age, gender, and geographic area. The program would also be implemented nation-wide and would be most effective if the research to develop it was sponsored by the government.

School rules and national laws regarding behaviors that increase risk for skin cancer could be important in lowering the rate of mortality from skin cancer in the United States. While not a part of an educational program these methods could also be very effective. While laws restricting sun exposure sound extreme and freedom inhibiting they could be made reasonably. We currently have laws that determine the age at which a person is allowed to drive a car and more pertinently, drink alcohol and smoke cigarettes. Several different laws could be developed, one of which would regulate a minimum age at which a person could use a tanning bed. Another example of a law would that be to say that a person of any age could only use a tanning bed for a certain number of hours a week.

School rules could also be effective in lowering sun exposure. Rules could be developed to require all children to wear sunscreen, to only allow children to be outside in the sun during peak UV hours for a limited time, or to require shady areas on playgrounds. A practical application of the sunscreen requirement could be making sunscreen use mandatory for students who participate in extra-curricular activities that take place outdoors such as any outdoor sport, like football or soccer.

Conclusion

In conclusion it is important to remember that skin cancer can be prevented in many cases by taking preventative steps. To take these steps however, a person must first know that they need to protect themselves, and then understand how they can go about doing that. Educational programs are how this can be achieved. They can also help to combat the idea of a healthy tan, which begins to influence children at an early age and can be held partly responsible for risk-taking behaviors regarding the sun. Hopefully,

this paper will help to both educate readers about skin cancer, and influence readers to help educate others.

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